

# PATENT ABSTRACTS OF JAPAN

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## (54) EPDM COMPOSITION

### (57)Abstract:

PROBLEM TO BE SOLVED: To obtain a composition excellent in low temperature characteristics and molding processability by incorporating a paraffinic process oil and an ester-based plasticizer with a peroxide-crosslinkable EPDM.

SOLUTION: The EPDM composition comprises 100 pts.wt. of an ethylene/ $\alpha$ -olefin/diene copolymer (EPDM), 0.5-10 pts.wt. of an organic peroxide, at least 15 pts.wt. of a paraffinic process oil and an ester-based plasticizer, and further, if required, a filler or reinforcing agent such as carbon black, silica or the like, an oxide or a hydroxide of a divalent metal such as zinc oxide or the like, stearic acid, an antioxidant, and the like. The organic peroxide includes dicumyl peroxide, 2,5-dimethyl-2,5-bis(tert-butylperoxy)hexane and the like. As the ester-based plasticizer are employed dibutyl, di-2-ethylbutyl, di-2-ethylhexyl, dioctyl, diisooctyl and other diesters of a 4-8C aliphatic dicarboxylic acid such as sebacic acid, azelaic acid, adipic acid and the like.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to an EPDM constituent. Furthermore, it is related with the EPDM constituent excellent in a low-temperature property and fabrication nature in detail.

[0002]

[Description of the Prior Art] Since thermal resistance and weatherability are good from the polymer structure and no plasticizer blending also has the good low-temperature property, EPDM is widely used as a molding material of an industrial part.

[0003] Since a compression set property with especially good gasket, bulb, etc. is required among these various components, a peroxide bridge formation system is used, but in the items as which fluidities, such as a complicated configuration and a thin configuration, are required since stand going up at the time of short \*\*\*\* and vulcanization has the quick induction period of vulcanization, a peroxide bridge formation system needs to add the plasticizer of 20 or more phrs in order to improve the poor moldability of that.

[0004] In this case, as a plasticizer, although paraffin series process oil with sufficient compatibility with EPDM is generally used, the inclination for the recovery factor in TR trial for which this plasticizer has a bad low-temperature property, and it is used as evaluation of actual low-temperature seal nature to get worse is seen (example of the after-mentioned comparison 1 reference). on the other hand, if the quantity of a plasticizer is decreased for improvement of a low-temperature property, a fluidity will spoil -- having -- the time of shaping -- the ground -- not flowing -- the ground -- it comes (example of the after-mentioned comparison 2 reference) to cause poor shaping, such as burning.

[0005]

[Problem(s) to be Solved by the Invention] The purpose of this invention is to offer the EPDM constituent excellent in a low-temperature property and fabrication nature.

[0006]

[Means for Solving the Problem] The purpose of this this invention is attained by the EPDM constituent which blended paraffin series process oil and an ester system plasticizer with the peroxide cross-linking EPDM.

[0007]

[Embodiment of the Invention] The ethylene-alpha olefin-diene copolymerization rubber to which ethylene and an alpha olefin were made to carry out copolymerization of various kinds of diene compounds as peroxide cross-linking EPDM is used. Bridge formation of that is performed by the organic peroxide generally used at a rate of about 0.5 to 10 weight section extent per EPDM100 weight section, for example, dicumyl peroxide, 2, the 5-dimethyl -2, a 5-bis(tert-butylperoxy) hexane, 2, the 5-dimethyl -2, and 5-bis(tert-butylperoxy) hexyne-3 grade.

[0008] In making or more into 0.35 the value of a product moldability and the flow Qmax which has taken good correlation, when for example, the hypoviscosity EPDM [ML 1+4 (100 degrees C):28] is used, as for the paraffin series process oil and the ester system plasticizer which are added by the

peroxide cross-linking EPDM as a plasticizer, the total quantity needs addition of the about 20 to 40 weight section preferably more than the about 15 weight section per EPDM100 weight section.

[0009] Although the improvement effect of a low-temperature property will be seen if an ester system plasticizer is used more than 1 weight section when this total quantity is 20 weight sections among those, it is desirable to use more than the about 3 weight section for acquiring the effectiveness that it becomes enough. In order for bleed out to appear in a product front face if thermal resistance and a compression set property come to fall and the about 15 weight section is surpassed as the loadings of an ester system plasticizer are increased, it is preferably used at a rate below the about 10 weight section.

[0010] As an ester system plasticizer, diester, such as the butyl of the aliphatic series dicarboxylic acid of the carbon numbers 4-8 of a sebacic acid, an azelaic acid, an adipic acid, etc., 2-ethyl butyl, 2-ethylhexyl, octyl, iso octyl, and isodecyl, is used.

[0011] Preparation of a constituent in addition to each above component A bulking agent or reinforcing agents, such as carbon black and a silica, The oxide of divalent metal or a hydroxide, stearic acid, process oil, An antioxidant etc. is blended if needed, it is carried out by kneading using a sealing kneading machine etc., and bridge formation of that is performed by the opening vulcanization performed for about about 0.1 to 20 hours at the press cure performed a grade for about 1 - 20 minutes at about 150-220 degrees C, and about 120-200 degrees C.

[0012]

[Effect of the Invention] A low-temperature property can be improved without sacrificing fabrication nature (fluidity) by using together paraffin series process oil and an ester system plasticizer as a plasticizer of the peroxide cross-linking EPDM.

[0013]

[Example] Next, this invention is explained about an example.

[0014]

Examples 1-3 EPDM [ML 1+4 (100 degrees C):28] The 100 weight sections (Mitsui Chemicals product EPT14030) FEF carbon black 80 \*\* zinc oxide 5 \*\* stearic acid 1 \*\* -- 2, 2, and 4-trimethyl-1 -- 2-dihydro quinoline A 0.5 \*\* Benz imidazole system antioxidant 1 \*\* paraffin series process oil 15 \*\* (Idemitsu Kosan product Diana PW380) Dicumyl peroxide 3.5 \*\* ((D) Nippon Oil & Fats product Park Mill) Dioctyl sebacate 5 \*\* (example 1) Dioctylazelate 5 \*\* (example 2) Dioctyl adipate Each combination component more than 5 \*\* (example 3) was kneaded with a 10 inch opening roll, and 180 degrees C and press cure for 6 minutes were performed about the kneading object.

[0015] Each following item was measured about the obtained vulcanizate. moreover, the ground -- measurement of flowability was also performed.

ordinary state physical-properties: -- JIS K-6301 conformity compression set: -- ordinary state physical-properties change low-temperature-test:TR10 value after 120 degrees C, 70 hour heat aging test:120 degree C, and 70-hour heating (ASTM D-1329), and the recovery factor in -30 degrees C -- the ground - - for [ flowability:150 degree-C, 80kg / of loads /, and preheating ] 60 seconds and psi1 dice JIS K-7210 -- reference [0016] In example 4 example 1, the amount of paraffin series process oil was changed into 19 weight sections, and the amount of dioctyl sebacate was changed into 1 weight section for the amount of FEF carbon black by 75 weight sections, respectively.

[0017] In example 5 example 1, the amount of paraffin series process oil was changed into 17 weight sections, and the amount of dioctyl sebacate was changed into 3 weight sections for the amount of FEF carbon black by 75 weight sections, respectively.

[0018] In example 6 example 1, the amount of paraffin series process oil was changed into 10 weight sections, and the amount of dioctyl sebacate was changed into 10 weight sections for the amount of FEF carbon black by 75 weight sections, respectively.

[0019] In example 7 example 1, the amount of paraffin series process oil was changed into 5 weight sections, and the amount of dioctyl sebacate was changed into 15 weight sections for the amount of FEF carbon black by 75 weight sections, respectively.

[0020] In example of comparison 1 example 1, the amount of paraffin series process oil was changed into 20 weight sections, and dioctyl sebacate was not used.

[0021] In example of comparison 2 example 1, the amount of FEF carbon black was changed into 75 weight sections, and dioctyl sebacate was not used.

[0022] The measurement result in the above each example and example of a comparison is shown in the next table.

A table An example The example of a comparison A parameter 1 2 3 4 5 6 7 1 2 [Ordinary state physical properties] Degree of hardness (JIS A) 70 70 69 69 69 68 67 69 69 The Wallace degree of hardness (IRHD) 70 69 69 70 69 68 67 69 A 69 100% modulus (MPa) 6.05.85.9 5.7 5.8 5.7 5.4 5.8 5.6 Tensile strength (MPa) 18.0 17.7 17.8 18.3 18.7 18.2 18.5 18.3 18.5 Elongation (%) 230 230 230 250 240 250 250 240 240 [a compression set] 120 degrees C, 70 hours (%) 14 15 16 14 14 20 30 15 15 [a heat aging test] Degree-of-hardness change (point) +4 +4 +5+3 +4 +6 +10 +3 +4 Tensile strength rate of change (%) +1 +2 +7 +4 +1 +8 +20 +6 +5 Elongation change (%) +5 +8 +7 -2 -3 -18 -30 +5+3 [a low temperature test] TR10 (degree C) -52 -52 -51 -48 -49 -53 -52 -48 -48-30" recovery factor (%) 68 67 68 47 57 70 69 45 57[-- the ground -- fluid] Flow Qmax (cc/second) 0.35 0.36 0.35 0.35 0.35 0.35 0.35 0.35 0.36 0.10

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